CHARACTERISATION OF AN EXOGAM CLOVER DETECTOR

S. Gros[a)], A.J. Boston[a)], A.R. Mather [a)], J. Norman[a)], G. Turk[a)] and I.D. Lazarus[b)]

[a)]*Oliver Lodge Laboratory, University of Liverpool, Liverpool, L69 7ZE, UK*
[b)]*CCLRC Daresbury Laboratory , Warrington, UK*

EXOGAM is a high efficiency gamma spectrometer dedicated to the spectroscopy with radioactive ion beams at GANIL (Grand Accelerateur National d'Ions Lourds, Caen, France). EXOGAM consists of an array of 16 segmented High Purity Germanium (HPGe) Clover detectors. A way to improve the position resolution of segmented HPGe detectors is the use of digital acquisition in conjunction with Pulse Shape Analysis. This allows the determination of the position of interaction within a segment, thus increasing the effective granularity of the detector. However, such a technique requires the prior characterisation of the detector response with the position of interaction in the germanium crystal. The characterisation of each Clover detectors of the EXOGAM array is in progress.

The Clover detector is composed of four HPGe crystals housed in the same cryostat. Each crystal comprises a central anode, and a four ways segmented outer cathode, resulting into 16 segments and 20 outputs of pre-amplified charge signals. Characterisation measurements, which consisted of a scan of the front face of a Clover, have been performed with a 2mm collimated ^{137}Cs source. The data acquisition system was composed of 5 VME GRT4 cards [1] which digitised the detectors signals with a 14bits, 80MHz flash ADCs. For each event, the detector charge signals were recorded for 3 minutes at each position and stored for later analysis.

The position calibration of the detector is based on charge Pulse Shape Analysis.1) It is possible to estimate the radial position of interaction in a crystal by observing the leading edge of the anode signals. The significant variations of different rise times (*T30* and *T90*, respectively the time from 10% to 30% and 10% to 90% of the total pulse magnitude) with radius of interaction allow the division of each segment into a minimum of 4 radial ranges. 2) The magnitude of the transient charge signals observed on adjacent electrodes can be used to evaluate the azimuthal position of the interaction.

Progress in the characterization of the Clover detector will be presented at the conference.

[1]   I.D. Lazarus, *Proc. of the IEEE Symposium on Nuclear Science*, Portland, 2003.